

Collective Generative Capacity: The Seed of IT-Induced Collective Action and Mass Innovation

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Abstract

Analyzing how IT-induced collective action and mass innovation emerge against the backdrop of an increasingly connected world, we introduce the concept of *collective generative capacity* as a new theoretical lens for ~~understanding~~ explaining the ability of distributed communities to engage collectively in bottom-up acts of transformational change and innovation.

~~Applying this lens allows us to understand how collective generative capacity emerges and evolves and how to design systems and spaces that evoke and enhance this communal generative capacity.~~

In this paper, we develop a working definition of collective generative capacity, argue that it is the seed ~~for processes~~ of IT-induced collective action and mass innovation, and analyze examine how these grassroots processes emerge and evolve in that respect through distributed communities. In addition, we demonstrate our thesis about collective generative capacity with an illustrative vignette on collective action and mass innovation of collective generative capacity. Jointly Finally, these insights are used to derive a set of principles for the designing of generative systems, which evoke and enhance collective generative capacity, hence, are conducive to IT-induced collective action and mass innovation. ~~Finally, we conclude with several implications for future research.~~

Keywords: collective generative capacity, collective action, mass innovation, creativity, distributed communities, systems design

¹ Please contact the authors for a current version of this work.

Introduction

The ubiquity of mobile computing has generated a worldwide integration platform for mass communication and collaboration that provides a space for universal compendia of ideas and creative expressions. Consequently, we witness a new form of collective action, that is not related to the tragedy of the commons and the provision of public goods—the core focus of traditional collective action theory—but rather centers on creative commons and bottom-up processes of collective transformation and collaborative acts of creativity as enabled by mobile and ubiquitous computing.

~~Simultaneously~~ At the same time, new sources of inspiration and innovation emerge from within large, undefined groups of people that operate outside conventional boundaries of businesses and institutions. Consequently, innovation is often no longer done *for* the masses, but rather *by* the masses (Leadbeater, 2008), a phenomenon popularly referred to as crowdsourcing or mass innovation. In more general terms, we witness a shift whereby processes of top-down innovation become increasingly complemented and sometimes replaced by collective grassroots contributions.

Although most of us are likely to acknowledge that increasing connectivity transforms the organization of innovation, as yet little scholarly attention has been paid-given to understanding these passionate, IT-induced bottom-up processes of mass-scale innovation and collective action, and innovation in particular general and the design of information systems that are conducive to such processes, in particular.

To fill this theoretical void, this paper we introduces the concept of ‘**collective generative capacity**’, that is, *the ability of a distributed community to engage collectively in producing novel configurations and possibilities, in changing conceptual frames, and in challenging the normative status quo within a particular goal-driven context*. Our theory of collective generative capacity is among the pioneering attempts to understand how collective ideas are turned into processes of collective action and mass innovation in the face of an increasingly connected world.

Stimulating the collective generative capacity contributes to a communally experienced positive energy affect.; ~~It empowers and liberates;~~ and thereby forms-forming an impetus to engage in collective action for communal well-being, common purposes, ~~communal well-being~~ and other transformational changes. ~~It~~ has the potential to be a source of major transformations that subsequently result in important technological breakthroughs or

social achievements, ~~and is likely to become the source of major transformations in the structures of organizing and innovating.~~

In order to ~~derived~~develop the theory of ‘collective generative capacity’, we review a set of analogous conceptualizations of its theoretical constituents: *collectivity* and *generativity*. These two constructs have been applied in the social sciences to understand a wide variety of phenomena, yet, each builds on a clear set of common denominators, which ~~will~~ provide the core underpinnings of our definition of collective generative capacity.

~~Furthermore, we affirm that~~ We would like to emphasize that collective generative capacity is inherently a human trait of a group of people, ~~e.g., i.e.~~ a community, and argue that it is the seed of IT-induced collective action and mass innovation. In other words, the ability of a distributed community to engage collectively in generating novel configurations and transformative change is the core capability that drives ~~produces processes of~~ collective action and mass innovation. We illustrate this assertion further by ~~aim to explain~~discussing how ~~these processes of~~ IT-induced collective action and mass innovation are enacted through *distributed communities, crowdsourcing, waves*, and a *positive focus on future potentialities*.

Furthermore, we suggest that in order to encourage people to be generative collectively, we should design generative spaces facilitated by generative systems. Based on ~~our~~ the conceptualization of ‘collective generative capacity’, we formulate a set of principles ~~is formulated~~ for the design of such generative systems. Specifically, we suggest that ~~These~~ systems should be *evocative, open, adaptive, and engaging* in order to elicit and encourage ‘collective generative capacity’, which in turn germinates and fuels ~~hence, processes of~~ collective action and mass innovation.

In the next section, we explore the ~~notion~~ conceptualizations of collectivity, review its theoretical background in the context of the social sciences and provide a working definition. Then, a similar theoretical exploration is provided with respect to generativity, and in this context, we pay special attention to generative capacity (Avital and Te’eni 2009). Subsequently, we link these two ~~theoretical fields~~ domains ~~are linked in order to~~ provide develop a working definition of ‘collective generative capacity’, establish its role as ~~which~~ forms the seed ~~for processes of~~ IT-induced collective action and mass innovation, ~~and~~. ~~These processes are then elaborately discussed and~~ illustrate our thesis with a vignette. Finally, we ~~use our theory of~~ apply the principles of ~~collective~~ generative ~~capacity~~ design to collective generative capacity and derive four ~~principles for the design of generative systems and a number of~~ propositions regarding the design relations between the use of ~~these~~ generative

systems ~~and that are conducive to collective action and mass innovation.~~ collective-generative capacity.

Theoretical Background

In this section, [we discuss](#) a set of foundational theories on collectivity and generativity from multiple social science disciplines ~~that is discussed. These conceptual insights~~ provides the background [and insight](#) for developing our theory of collective generative capacity.

Collectivity

Collectivity is defined generally as the quality or state of constituting a collective whole. A collective is a number of persons considered as one group and is characterized by some sort of similarity among its members (Webster, 2009). For instance, members [may](#) share a common interest or work together to achieve a common objective. However, there are different levels of collectivity ranging from small groups (e.g. work teams) to organizations, [from ad-hoc alliances to longstanding federations, and various instances of society at large. In general, collectivity refer to an assemblage](#) ~~to systems²—a group~~ of independent but interrelated elements comprising a unified whole and linked together for some common purpose or function. In this paper, the focus is on large distributed communities ~~for that engage in IT-enabled~~ collective action and mass innovation, ~~which are enabled by mobile, ubiquitous computing.~~

The concept of *collectivity* or *collective* is closely related to that of community, derived from the Latin word *communitas*, which broadly refers to joint possession or use, fellowship or organized society (Oxford Latin Dictionary). More specifically, a community can be defined as a unified body of individuals with a common (e.g. professional) interest, characteristic or location (Webster, 2009). [In this section, w](#)~~We~~ examine several influential theories from various disciplines in which the terms ‘collective’ or ‘community’ ~~were is~~ used in conjunction with theory development (see summary in Table 1) [to provide the theoretical foundation of the social component and then develop its application to the notion](#) of collective generative capacity in ~~particular, and~~ the [context of](#) information systems ~~field in general.~~

The ~~notion~~[conceptions](#) of collective and community have been applied frequently in the context of the social sciences and humanities. Within the discipline of sociology, the ~~notion—idea~~ of [collective—collectivity is developed was used](#) in the classical work of

²Systems theory analyzes the nature and operation of complex systems in nature, society, and science. A system can therefore be a single organism, a technological artefact or system, an organization, or society at large.

Durkheim's *De la Division du Travail Social*³ (1893), where he introduces the notion of *la conscience collective*, i.e. collective consciousness. Based on the analysis of traditional, tribal societies, Durkheim (1893) argues that religion played an important role in unifying the members of society by means of creating a common consciousness. In these traditional societies, the individual's consciousness is largely shared with all the other members, creating a mechanical solidarity—a form of solidarity based on kinship ties—through mutual likeness. Even though according to Durkheim (1893) the modern society is characterized instead by organic solidarity—a form of interdependence that arises due to specialization and the division of labor—we can still identify various forms of collective consciousness in the modern society, such as groupthink⁴, memes⁵, and solidarity still prevail in the modern society. Collective consciousness is a higher order consciousness based on collective representations and communal language-based reflective processes (Burns and Engdahl, 1998).

Table 1. Applications of the collectivity and community concepts in various disciplines

Discipline	Theory	Collective feature
Sociology (Emile Durkheim, 1897)	Collective consciousness (<i>conscience collective</i>)	A higher order consciousness shared by all members of (traditional) societies and is based on collective representations and language-based reflective processes
Psychology (Carl Jung, 1953)	Collective unconscious	Encompasses archetypes (representations collectives)—definite pre-existent forms in the psyche—that are shared and identical in all individuals.
Political Science, Sociology, Economics (Mancur Olson, 1965; Herbert Blumer, 1951)	Collective action/ collective behavior	The pursuit of a goal or set of goals or the provision of public goods by a group of people.
Organization Science (Argyris & Schön, 1978 ; Nonaka & Takeuchi, 1995; Von Krogh, 2009)	Organizational learning	Results from the communication, interaction, and sharing of knowledge among individual members of the collective, resulting in shared meanings.
Cognitive Science, Psychology (Ed Hutchins, 1990, 1991, 1995)	Distributed (Collective) cognition	Focuses on the distributed cognitive system which encompasses a group of people interacting with each other and representational media in order to accomplish a common goal.
Organization Science (Lave & Wenger, 1991; Brown & Duguid, 1991)	Community of Practice	A group of people characterized by common interests, trust, and mutual engagement in the pursuit of common goals.
Organization Science (Karl Weick & Karlene Roberts, 1993; Erden <i>et al.</i> 2008)	Collective Mind and Collective Improvisation	A pattern of heedful interrelations of actions and collective mental processes of a group of individuals embedded in a social system, which influences the system's performance.
Communication Science (Pierre Lévy, 1994)	Collective (Symbiotic) intelligence	A shared or group intelligence that emerges from technology-enabled collaboration among many individuals and which results in enhanced intellectual performance.
Organization Science (Hargadon	Creative Collectives	Creativity is the result of the (re)combination of ideas

³ *The Division of Labour* (French)

⁴ See Janis, 1972

⁵ See Dawkins, 1989

In the field of psychology, Jung (1953) introduced the notion of *collective unconscious* that refers to a part of the psyche which unlike personal unconscious does not owe its existence to personal experience, but rather to heredity. While the personal unconscious is made up essentially of contents which were conscious at one time, but have been forgotten or repressed, the contents of the collective unconscious have never been in consciousness. The collective unconscious is made up of archetypes—definite pre-existent forms in the psyche—which seem to be present always and everywhere. This theory of the archetypes was built on the notions of *répresentations collectives* of the French philosopher Lévy-Bruhl's (1923) and primordial thoughts of the German anthropologist Adolf Bastian (1868). The collective unconscious implies psychological forms that are shared and identical in all individuals.

Within economics, sociology, and the political sciences, the theory of *collective action* has received a great deal of scholarly attention. Collective action is about the pursuit of a shared goal by a group of people. The discussion of collective action by the economist and social scientist Olson (1965) is primarily concerned with the problem of 'free riders' in the provision of public goods—those goods that require group action in order to be provided, but are simultaneously non-rivalrous and non-excludable. Economists (Coase, 1937) and political scientists (Axelrod, 1984) have generally adopted a rational choice perspective to understand problematic group decision-making situations in which the uncoordinated actions of each player result in sub-optimal outcomes⁶. Sociologists have addressed the collective action problem to analyze the emergence of social movements and social integration and have analyzed those instances of collective behavior (Blumer, 1951) that arise spontaneously without reflecting existing social structures. In sum, collective action thus relates to the pursuit of a goal or set of goals or the provision of public goods by more than one person.

In organizational science, the theory of *organizational learning* (Argyris and Schön 1978, Nonaka and Takeuchi, 1995) is predominantly occupied with the question of how collectives of individuals learn and collective knowledge (Von Krogh, 2009). Organizational learning, in the sense used by Argyris and Schön (1978), should be understood as a metaphor and refers to the ongoing construction, through private inquiry, of organizational theory-in-use. Individual learning is thus a necessary, but not sufficient, condition for organizational learning. Organizational learning involves the knowledge shared by the members of an

⁶ E.g. the famous Prisoners' Dilemma

organization. Hence, the core processes underlying organizational learning are communication, interaction, and the exchange of information among individual members of the collective, resulting in common frames of meaning (Duncan and Weiss, 1979).

In cognitive theory, Hutchins (1990) coined the *distributed cognition* theory to analyze and understand the cognitive processes that occur in a system of actors interacting with each other and an array of artefacts—representational media—to perform some sort of ‘collective activity’. Human agents collectively make distributed cognitive systems work and provide intentional cognitive agency to the system. Yet, at the same time, they are embedded in—and hence constrained by—these systems. Distributed cognition theory holds that we can understand cognition by looking at the use of embodied representational media (artefacts) in everyday practices of work. Therefore, the unit of analysis is the distributed cognitive system which essentially entails a group of people interacting with each other and with artefacts in order to accomplish a common goal (Perry, 2003).

In organization science, Lave and Wenger (1991) coined the *community of practice* (CoP) concept to refer to a group of people that emerges from intensive contact between people with a common interest or occupation. Related conceptions are “thought collective” (Fleck, 1979), “interpretive community” (Fish 1980) and “community of knowing” (Boland and Tenkasi 1995). A CoP is essentially a social entity with members bound together by shared practices, trust, and mutual engagement (Brown and Duguid, 1991; Wenger, 2000). Given these communal characteristics, CoPs are often used as project teams to nurture, share, and sustain tacit knowledge (Hildreth and Kimble, 2002). In short, communities of practice, and the abovementioned related conceptions, evolve around processes of collective learning and shared socio-cultural practices which emerge over time when people with common interests interact to achieve common goals.

Within the organization sciences, the aforementioned theories of distributed cognition and communities of practice were adopted to develop the notion of the *collective mind* (Weick and Roberts, 1993), which aims to understand and explain collective mental processes in organizations. The theory focuses on the interrelations of actions and collective mental processes, which jointly influence an organization’s performance. As humans construct their own actions (contribute), they envisage a social system of collective actions (represent), and they interrelate their constructed actions with this envisioned system (subordinate). Collective mind thus refers to a pattern of heedful interrelations of actions of a group of individuals and

the capacity of the group to act intuitively and spontaneously through collective improvisation (Erden *et al.*, 2008).

In communication science, Lévy (1994) introduced the *collective intelligence* theory to shed light on the potential role of information and communication technologies in promoting the construction of intelligent communities. Within these intelligent communities our social and cognitive potential can be mutually developed and enhanced, thereby establishing a collective intellect or imagination based on shared mental abilities. He argues that the major architectural project of the 21st century will be to build and improve an interactive cyberspace, which will assist us in navigating knowledge and enable us to think collectively. Collective intelligence is thus a shared or group intelligence that emerges from technology-enabled collaboration among many individuals and which results in enhanced intellectual performance⁷.

A final application of collectivity within the organization science literature can be found in the work of Hargadon and Bechky (2006) on *creative collectives*, which stresses the importance of shifting the level of analysis from the individual to collectives in studies of creativity. Creative insights and solutions do not emerge from the sole province of individual cognition, but rather emerge from the interactions between individuals—from the “fleeting coincidence of behaviors”. It is through social and collaborative processes that knowledge and ideas are created, shared, amplified, enlarged, and justified in organizational settings (Alavi and Leidner 2001). Creativity is thus the result of the (re)combination of ideas from individuals with similar interests who jointly engage in creative collectives.

The above review reveals a set of analogous ~~theories~~ conceptualizations of collectivity from various disciplines. The common denominators in all these conceptualizations ~~theories~~ are: shared interests or goals; collaborative actions and collective engagements (e.g. in knowledge sharing, intellectual or creative endeavors); and in more general terms the significance of groups or systems as meaningful units of analysis. In sum, *collectivity* refers to *the collective and collaborative engagement of a group of people (i.e. a community) with shared interests or goals— in meaningful actions.* ~~However,~~ the degree of collective engagements may range from lower-order collective action—based on shared memory, routines, and culture—to higher-order collective action—based on high-quality collective tacit knowledge and collective improvisation (Erden *et al.*, 2008).

⁷ Some researchers analyze collective intelligence in bacteria and animals, but since the focus in this paper is on collective generative capacity in task-driven contexts, this is not immediately relevant in this respect

Although some of the abovementioned theories have been criticized for reifying these aggregate entities by assuming their agency, it would be better to state that most authors do not assume higher-level agency, but rather suggest that we should not assume that whatever can be said about collectives and communities actually “boils down” to things about individuals (Cook and Brown 1999). Rather, there is something transcendent about collective generative capacity, which cannot be achieved by any one individual in isolation. Yet, in effect, individual generativity is essentially constitutive of collective generative capacity. Before we go into exploring collective generative capacity, let us first examine the [notion](#) [concept](#) of generativity in more detail.

Generativity

Generativity refers to the ability to originate, produce or procreate. The concept of generativity has been used effectively in multiple disciplines, for example: generative capacity (Gergen 1994), generative metaphors (Schön 1979), generative inquiry (Zandee 2004), generative buildings (Kornberger and Clegg 2004), and generative fit (Avital and Te’eni 2009). An overview of these different uses in various social science disciplines is provided in Table 2 below, adapted from Avital and Te’eni (2009) and extended for the purpose of this paper by adding the notions of generative building (Kornberger and Clegg, 2004), generative learning (Yorks, 2005), and generative fit (Avital and Te’eni, 2009). The common denominators in all these conceptualizations are the drive to revitalize or rejuvenate; the production of novel configurations and new possibilities; as well as an attempt to challenge the [normative](#) status quo.

In our attempt to conceptualize collective generative capacity, we primarily build on the notion of generative capacity, which refers to one's ability to generate creative ideas that lead to innovation or produce overall value. ***Generative capacity*** comprises *one's ability to produce new configurations and possibilities, to reframe the way we see and understand the world and to challenge the normative status quo in a particular task-driven context* (Avital and Te’eni 2009).

Generative capacity is inherently linked to creativity. Yet, whereas literature and studies on creativity focus primarily on the creative *output*—i.e. the newness, uniqueness, or utility of the output—with no clear understanding of the fundamental mechanisms and sources influencing creativity, generative capacity focuses on one’s potential to produce a

creative output, hence, it elucidates the *root-causes* underlying creativity and subsequent innovation (Avital and Te'eni 2009; Drazin *et al.* 1999).

Consequently, by taking the concept of generative capacity as our point of departure, our analysis is characterized by a shift in focus, moving from a discussion of creativity, which is geared toward a finite end-result (output), toward a discussion of generative capacity that centers on the perpetual and life-giving sources of generativity.

Table 2. Applications of the generativity concept in various disciplines

Discipline	Theory	Generative feature
Psychology (Erik Erikson, 1950)	Psychosocial generativity	A focus on productivity and creativity; the drive to rejuvenate; to reproduce; to guide and provide for the next generation.
Linguistics (Noam Chomsky, 1972)	Generative grammar	A finite set of rules that generate infinite syntactical configurations.
Organization science (Donald Schön, 1979)	Generative metaphor	A figurative description of social events by which we gain new perspectives, i.e. by which our attitudes and behaviors toward them are shaped and altered.
Social psychology (Kenneth Gergen, 1994)	Generative capacity	The ability of the individual to challenge the status quo and to transform social reality and social action.
Architecture (Christopher Alexander, 1996)	Generative schemes	A set of simple instructions that allows anyone with basic skills to create a well-constructed artefact that is adjusted to its unique context. Its simplicity gives rise to infinite variations, depending on the context.
Computer science (John Frazer, 2002)	Generative evolutionary design	Generating design concepts, which are capable of being expressed in a variety of forms in response to different environments. The discovery of new design alternatives can be inspiring to designers and/or challenge conventional designs.
Social studies (Danielle Zandee, 2004)	Generative inquiry	A recurring and reflective hermeneutic process that generates theoretical quantum leaps. It offers a revitalization process of our epistemic stance that can redefine our personal, professional, collective, and social existence.
Organization science (Martin Kornberger and Steward Clegg, 2004)	Generative buildings	An undefined space that invites its inhabitants to (ab)use and (re)define space in infinite ways. It provides the stage on which people can interact freely and enact their ideas creatively, in surprising ways.
Educational science (Lyle Yorks, 2005)	Generative learning	A form of learning that is necessary for transformational changes in practice. It involves double-loop learning, which questions and reframes our assumptions and our interpretive schemes.
Information systems (Michel Avital and Dov Te'eni 2009)	Generative fit	An aspect of a system that enhances the human resources needed in the production of new, ingenious, task-driven output configuration. It evokes and increases one's generative capacity.

Source: Avital and Te'eni (2009) (adapted and extended)

Furthermore, we extend the notion of generative capacity beyond its original focus on the individual⁸ and direct our attention toward those generative processes that occur within and between collectives. ~~It is through this he focus analysis of on collectives and communities that we hope to disentangle the idiosyncracies and multiplicities of collective~~

⁸ The notion of generative capacity has its origins in psychology, hence, does not consider the collective as a unit of analysis.

generative capacity—and its ~~manifest processes of consequent IT-induced~~ collective action and mass innovation ~~is aimed to serve as a springboard for shedding light on—in order to inform~~ the key requirements for the design of co-generative information systems.

Collective Generative Capacity

Based on the theoretical insights from the previous sections, several ~~common denominators motifs~~ of collectivity and generativity are identified and summarized in Table 3 ~~below~~ follows:

Table 3. Common ~~denominators themes~~ of collectivity and generativity

Collectivity	<input type="checkbox"/> Communities or groups of people with shared interests or goals <input type="checkbox"/> Collective action <input type="checkbox"/> Mutual engagement, interaction, and exchange
Generativity (generative capacity)	<input type="checkbox"/> Producing novel configurations and new possibilities (revitalizing) <input type="checkbox"/> Reframing the way we see and understand the world <input type="checkbox"/> Transformational change and challenging the status quo

An amalgamation of these characteristics of collectivity and generativity results in the following working definition of **collective generative capacity: the ability of a distributed community to engage collectively in producing novel configurations and possibilities, in changing conceptual frames, and in challenging the normative status quo within a particular goal-driven context.**

This definition consists of several elements relating to the concepts of collectivity and generativity (or generative capacity). First, it stresses the importance of communities and in particular of *distributed communities* in the context of a discussion centered on IT-enabled collective action and mass innovation. Communities are about relationships and a sense of belonging. Hence, communities hold the seed for collective transformation through mutual engagement.

Secondly, our definition ~~emphasizes might imply~~ shared goals ~~for it links collective generative capacity to our interests in~~ a *particular goal-driven context*. ~~Simultaneously, however, This is not in contradiction with the likelihood that~~ the ability of a community to act or innovate collectively is ~~based on~~ enhanced by the diversity of its members, or in other

~~words, that is,~~ collective generative capacity does not necessarily require shared interests. ~~Nevertheless~~ Clearly, an espoused sense of common purpose, i.e. a goal-driven context, is essential for the ability of a distributed community to engage in collective transformation or innovation.

Thirdly, both collective action and mutual engagement are embedded in our definition of collective generative capacity by ~~stressing-reaffirming~~ the ability of the community to *engage* in key processes of collective action, namely *changing conceptual frames* and *challenging the normative status quo*. These two collective acts are closely intertwined, for the act of changing the ways we see, understand, and talk about the world lays the necessary foundation for collective transformation of the normative status quo.

Fourthly, ~~the definition underscore it stresses all the three core the elements dimensions~~ of generative capacity, namely: 1) *producing novel configurations and possibilities*, 2) *changing conceptual frames*, i.e. reframing the way we see and understand the world, and 3) *challenging the normative status quo*. That is, collective generative capacity represents the ability to innovate or change products and processes, to innovate or change ~~our own~~ personally commonly held worldviews, and to innovate or change the prevailing value system. ~~current state of things respectively.~~

With ~~respect to these three levels of change or innovation that regard~~, it is important to note that reframing the way we see and understand the world is fundamental to a transformational change of the normative status quo. For without questioning and altering our basic beliefs and conceptual frames, we are unable to create a significant change in our ways of doing. In other words, collective action and mass innovation are unlikely to emerge without challenging our worldviews and envisioning a new image for the future.

A final element of our definition that ~~requires additional~~ deserves further emphasis is that collective generative capacity is a human-property ~~that can be attributed to of~~ a collective of people, e.g., a community,; and ~~that it stems from is constituted by~~ the generative capacity of ~~individuals~~ the individual community members. ~~However~~ With that regard, the collective generative capacity of a community transcends the generative capacity of its individual members, in the same way ~~as that~~ organizational learning is more than the sum of the learning ~~processes~~ of individuals comprising the organization (Argyris and Schön, 1978). In short, the collective generative capacity of a community is ~~its-the~~ synergistic capability (i.e., human collective trait) of a community to engage in generative processes ~~such as of IT-induced~~ collective action and mass innovation. ~~Hence, collective generative capacity provides the seed of collective transformation and innovation.~~